No. 2 — *Studies of Myctophinae in the Museum of Comparative Zoölogy*

By A. E. Parr

I. A revision of the type specimens of *Myctophinae* in the Museum of Comparative Zoölogy

These notes should be considered in a series with the writer's previous revision of the type-specimens of *Myctophinae* in the U. S. National Museum [1] and practically completes the task of attempting to bring the descriptions of the older species based upon material in American collections up to modern requirements in regard to taxonomic detail and technical terminology. The other major collections of this group apart from the material in the Bingham Oceanographic Collection [2] have all been so relatively recently described and illustrated that any revision at this time would be entirely uncalled for.

In regard to the terminology applied to the various luminous organs reference may be made to the previous notes on the types in the United States National Museum above referred to or to the earlier revision of the entire subfamily *Myctophinae* given in the report on the Iniomi obtained during the third Oceanographic Expedition of the Pawnee. [3]

Since the illustrations previously published of various of the types to be reported upon in the following were all prepared before the taxonomic significance of the minor details in the geometric arrangement of the photophores had yet been fully realized, it has been considered desirable to redraw these species in the diagrammatic manner currently used for the figuring of myctophine fishes, in order to show plainly the patterns formed by the luminous organs and to facilitate comparisons with other illustrations in the modern manner. It might be mentioned that the two "maculae operculares" or, more accurately, preopercular organs, inconsistently shown in current illustrations of this group, have been entirely omitted from all figures in this report as being inessential for the identification of the species and normally not as conspicuous in the lateral view as are the rest of the photophores.

[1] A. E. Parr. Notes on the species of Myctophine Fishes represented by type specimens in the United States National Museum. Proc. U. S. Nat. Mus., **76**, Art. 10, Washington, 1929.

[2] Chiefly the collections of the Carnegie Museum in Pittsburg and also the material obtained by Dr. Beebe for the New York Zoölogical Society.

[3] A. E. Parr: Deepsea fishes of the order Iniomi from the waters around the Bahama and Bermuda Islands. Bull. Bingham Oceanogr. Coll., **III**, Art. 3, New Haven, Conn., 1928.

Myctophum laternatum Garman

Myctophum laternatum Garman, Rep. Expl. Albatross 1891. XXVI. The Fishes. Mem. Mus. Comp. Zoöl., **24**, 1899, p. 267, pl. 56, fig. 1.
Type No. 28492 M. C. Z. (7 specimens).

PLO closer to pectoral fin than to the lateral line. 2 PVO, the upper at the lower corner of the pectoral fin base. Lower PVO above the interspace between second and third PO, below and far in advance of the upper PVO, the line through the two PVO passing well above even the first PO. 5 PO in an equally spaced, straight series. VLO about midway between ventral fins and lateral line or slightly closer to the

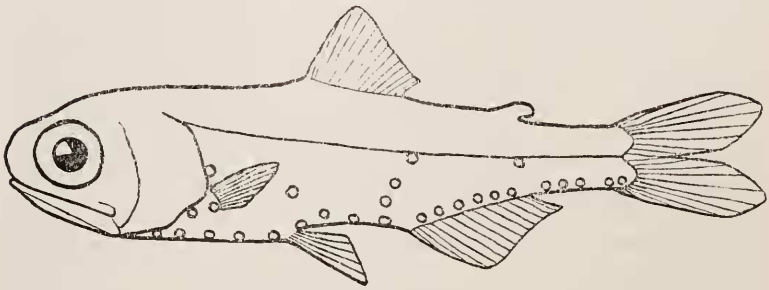

Fig. 1. *Myctophum laternatum* Garman

former. 4 VO, the second VO slightly elevated. 3 SAO, with the centre of the lower SAO very slightly below and behind the line through the centres of the upper two organs so that the three SAO form a slight but distinctly indicated angle with the convexity upward and forward. Lower SAO almost vertically above fourth VO. Second SAO slightly closer to the lower than to the upper SAO. Upper SAO in the lateral line vertically above or anterior to the first AO. AO 6–7 + 2–3 in the following combinations: 6 + 2, 1 count; 6 + 3, 6 counts; 7 + 2, 1 count; 7 + 3, 2 counts. Asymmetry was found in two of the seven specimens. AO equally spaced and all on the same level in both sections of the series. AO posteriores entirely behind the base of anal fin. 1 POL at the ventral edge of the lateral line. 2 PRC arranged horizontally at the lower margin of the caudal fin base, well separated from the AO posteriores.

Two of the specimens gave the following measurements:

Total length without caudal fin in mm.	24	25
Length of head in per cent of length without caudal fin	31	32
Diameter of eye in per cent of length without caudal fin	9.5	10.8
Lower jaw in per cent of length without caudal fin	21	20
Snout to D in per cent of length without caudal fin	50	48
Snout to V in per cent of length without caudal fin	46	44
Snout to A in per cent of length without caudal fin	62	62
Depth of body in per cent of length without caudal fin	25	24

One specimen shows an accessory photophore on one side immediately above the lateral line directly in advance of the normal POL. The phenomenon is accompanied by a slight, pathological looking swelling at this point.

Myctophum aurolaternatum Garman

Myctophum aurolaternatum Garman, Rep. Expl. Albatross 1891. XXVI. The Fishes. Mem. Mus. Comp. Zoöl., **24,** 1899, p. 264, pl. 55, fig. 3. Type No. 28494 M. C. Z. (4 large specimens).[1]

PLO somewhat closer to the base of pectoral fin than to the lateral line, the distance from the former being only around 2/3–3/4 of the distance from the latter. 2 PVO in a series with the first PO. Upper PVO immediately below and anterior to the pectoral fin base. Lower PVO in an almost straight line between upper PVO and first PO, about equidistant from second PO and upper PVO but farther removed from first PO. 5 PO in a straight, about equally spaced series. Second PO immediately behind the lower PVO. VLO approximately midway between lateral line and ventral fins. 4 VO in a straight, equally spaced series. 3 SAO in a straight, about equally spaced, slightly oblique series. Lower SAO above, very slightly behind the fourth VO and closer to the latter organ than to the second SAO. Fourth VO slightly below and behind the continuation of the line through the three SAO. Upper SAO only about one quarter of a diameter below the lateral line. AO in two equally spaced straight series in which the numbers shown in the accompanying table were counted on the four specimens in the type sample and 21 smaller specimens in sample No. 28495 M. C. Z. 11 of these specimens gave

[1] There is also another sample (No. 28495 M. C. Z.), marked as a type of this species, which contains 21 quite small specimens.

asymmetric counts and the frequency of the totals for both sections of the series of anal organs distribute themselves in the following manner. Total AO 14 in 1 count; 15 in 20 counts; 16 in 18 counts; 17 in 7 counts; 18 in 2 counts. 1 POL situated above the interspace between the ultimate and penultimate AO anterior, about one-quarter of a diameter below the lateral line. First

AO anteriores	posteriores 5	6	7
9	1	2	
10	18	7	3
11	11	4	1
12		1	

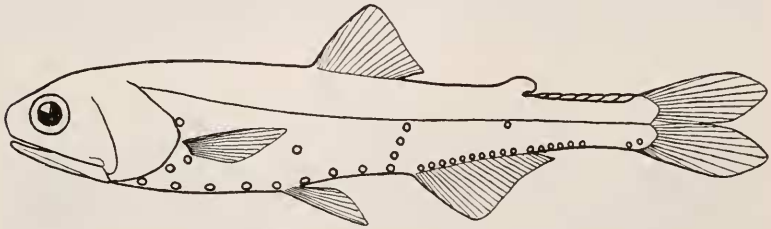

Fig. 2. *Myctophum aurolaternatum* Garman

AO posterior at the base of the last anal fin ray. 2 PRC at the lower margin of the caudal fin base, widely separated from the AO posteriores. The second PRC only slightly higher than the first.

7 supracaudal luminous scales occupy the entire distance between the caudal and the adipose dorsal fin in two of the specimens (males?). 3 minute infracaudal luminous scales between AO posteriores and PRC in a third (female?).

The following proportions were found in three of the specimens in the type sample:

Total lengths without caudal fin in mm.		80	88	90
Length of head	In per cent of length without caudal fin	26	27	27
Diameter of eye	"	7.5	9.0	8.0
Length of lower jaw	"	16	17	17
Depth of body	"	19	18	19
Depth of caudal ped.	"	7.5	7.0	6.5
Snout to D	"	48	49	48
Snout to V	"	43	43	43
Snout to A	"	60	62	62

The general appearance of the species has been well described by Garman in his original account and is also indicated in the accompanying sketch. *M. aurolaternatum* is one of the more elongate and least compressed species of *Myctophum*, with an almost fusiform body in the adults (greater compression in the smaller specimens).

Myctophum coccoi Cocco

Myctophum tenuiculum Garman, Rep. Expl. Albatross 1891. XXVI. The Fishes. Mem. Mus. Comp. Zoöl., **24**, 1899, p. 262, pl. 7, fig. 2.
Type of *Myctophum tenuiculum* No. 58499 M. C. Z. (4 specimens).

An examination of the type of *M. tenuiculum* can only serve to confirm its identity with *M. coccoi*, with which it has already previously been synonymized. AO 6 + 10/6 + 10; 6 + 10/6 + 10; 6 + 10/6 + 11; 6 + 10/7 + 9. In the case of the specimen with AO 6 + 10/7 + 9 there are unmistakably 3 PRC in a horizontal series symmetrically developed on both sides of the tail and well differentiated from the AO posteriores both in regard to size and arrangement. The specimen is otherwise entirely in agreement with the rest of the material.

Myctophum affine Lütken

Myctophum nitidulum Garman, Rep. Expl. Albatross 1891. XXVI. The Fishes. Mem. Mus. Comp. Zoöl., **24**, 1899, p. 266, pl. 56, fig. 3.
Type of *Myctophum nitidulum* No. 28493 M. C. Z,

An examination of the type of *M. nitidulum* confirms its identity with *M. affine*, with which it is currently synonymized.

Myctophum macrochir Günther

Myctophum atratum Garman, Rep. Expl. Albatross 1891. XXVI. The Fishes. Mem. Mus. Comp. Zoöl., **24**, 1899, p. 268.
Type of *Myctophum atratum* No. 28491 M. C. Z.

Myctophum atratum Garman is currently synonymized with *M. reinhardti*, as first tentatively suggested by Brauer and previously accepted by the writer and by other investigators. An examination of the type specimen, however, reveals the fact that its identity is not

with *M. reinhardti* but with the closely related *M. macrochir* Günther, and Garman's species should therefore be transferred from the synonymy of the former to that of the latter name.

The type of *M. atratum* shows the first SAO closer to the third than to the second VO. VLO well above the line through first and second SAO. AO 6 + 6.

Lampanyctus oculeus (Garman)

Myctophum oculeum Garman, Rep. Expl. Albatross 1891. XXVI. The Fishes. Mem. Mus. Comp. Zoöl., **24**, 1899, p. 260, pl. 56, fig. 2.
Type specimen No. 28500 M. C. Z. (8 specimens).

Identical with *L. mexicanus* (Gilbert) with which it should be synonymized. [1]

Lampanyctus leucopsarus (Eigenmann and Eigenmann)

Myctophum leucopsarum Eigenmann and Eigenmann, Proc. Calif. Acad. Sci., 2d ser., **3**, 1890, p. 5.
Type No. 27389 M. C. Z. (2 specimens).

PLO much nearer to the lateral line than to the upper PVO. 2 PVO, the lower slightly in advance of the upper in one of the specimens, slightly behind in the other. 5 PO, the second PO well behind the vertical from the upper PVO. Fourth PO elevated to the level of the interspace between the two PVO. VLO entirely lacking in the types, possibly normally absent in the species. 5 VO, the second VO elevated and advanced so as to become situated about two photophore-diameters vertically above the first VO. 3 SAO in a practically straight line falling immediately behind the last VO. Second SAO closer to the lower than to the upper organ in the same series. Upper SAO about one diameter below the lateral line immediately in advance of the vertical from the first AO. AO 6 + 7. 1 POL above the interspace between the AO anteriores and posteriores and about one-half of a diameter below the lateral line. AO posteriores entirely behind the base of anal fin and well separated from the PRC which are four in

[1] See Parr: Bull. Bingham Oceanographic Coll., **II**, Art. 4, p. 30.

number and arranged in an equally curved series ending with the upper PRC about 1–2 diameters below the end of the lateral line. The interspace between the third PRC and the fourth is somewhat enlarged.

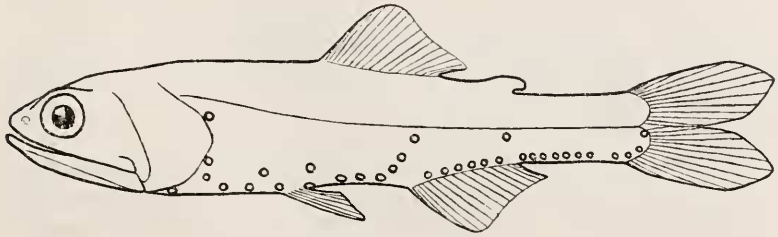

Fig. 3. *Lampanyctus leucopsarus* (Eigenmann and Eigenmann)

Table of measurements of type sample

Total length without caudal fin in mm.		77	72
Length of head	In percent of length without caudal fin	30	28
Diameter of eye	"	6.5	6.3
Length of lower jaw	"	20	21
Depth of body [1]	"	18	17
Snout to D	"	47	47
Snout to V	"	43	43
Snout to A	"	60	58

The question of the presence or absence of the VLO in this and the closely related species *L. nannochir* has already been discussed by the writer in a previous publication[2] in which the suggestion is made that the so-called VLO in the latter species may actually be homologous with the second VO in *L. leucopsarus*, the photophore in question having become still further advanced and elevated than in the last named form. Under this interpretation, both species could be said to have five VO and to have lost their VLO. But for practical purposes it is perhaps advisable to apply the nomenclatural symbols in the conventional manner according to the relative positions of the organs alone, in which case a VLO but only 4 VO could be said to be present

[1] This measurement is hardly very reliable in the type specimens, as they appear to have been artificially compressed in preservation.

[2] A. E. Parr. Notes on the species of Myctophine Fishes. . . . Proc. U. S. National Mus., **76**, Art. 10, p. 18 footnote 18.

in *L. nannochir*, while there can hardly be any question about the nature of the elevated second VO in *L. leucopsarus* so that this species would still be said to have 5 VO but apparently no VLO, at least not in the type specimens.

Lampanyctus crocodilus Risso 1810

Lampanyctus peculiaris Borodin. Some new deep sea fishes. Proc. New Engl. Zoöl. Club, **10**, 1929, p. 3.

Type of *L. peculiaris* No. 31628 M. C. Z.

A closer examination of the type of *L. peculiaris* has revealed the presence of three photophores on each cheek, [1] in exactly the arrangement characteristic of *L. crocodilus*, and leaves no doubt about its identity with the latter species, of which it appears to be a quite typical representative.

There are a couple of luminous scales in the anterior edge of the adipose dorsal fin, 2 supracaudal scales immediately in front of the caudal fin base above, and a luminous scale immediately behind the base of anal fin would seem to indicate that the entire ventral edge of the free caudal peduncle must have been occupied by a series of such scales. Of these, however, only the anterior scale, just mentioned, and the last 3 scales in front of the caudal fin are still to be found in the specimen on hand, the others having obviously been lost by violence, and it is therefore impossible to arrive at the total count for the infracaudal luminous scales in this case. Apparently one of the best preserved specimens of this species is that which served as the type of Goode and Bean's *L. gemmifer* (No. 35604 U. S. N. M.), of which an illustration has already previously been rendered by the writer. [2] In this specimen 9 infracaudal and 4 supracaudal luminous scales were observed, the infracaudal scales occupying the entire space from anal to caudal fin.

Diaphus dumerili Bleeker

Myctophum nocturnum Poey, Mem. Hist. Nat. de Cuba, **2**, 1860, p. 426.

Diaphus nocturnus Gilbert, Bull. Mus. Comp. Zoöl., **46**, No. 14, 1906, p. 255, pl. 1.

Type of *Diaphus nocturnus* (Poey) Gilbert No. 6871 M. C. Z.

A reëxamination of the type specimen of *D. nocturnus* (Poey) can merely serve to confirm the current conception of the characters and identity of this form.

[1] The upper photophore on the left side has been lost, which, however, undoubtedly represents an accidental feature of molestation in the preserved specimen.

[2] Proc. U. S. National Mus., **76**, Art. 10, 1929, fig. 13, p. 27.

Diaphus intermedius Borodin

Diaphus intermedius Borodin. Some More New Deepsea Fishes. Proc. New Engl. Zoöl. Club, **11**, 1930, p. 89.
Type specimen No. 32289 M. C. Z.

Upper antorbital of moderate size, circular, situated entirely above the nostril. Antorbitals of the two sides well apart from each other. No lower antorbital. A single large suborbital, on each side extending from somewhat in advance of the vertical from the anterior margin of the eye to somewhat behind the vertical from its centre, the length of the suborbital organ equalling about two-thirds of the diameter of the eye. Suborbital organ exposed to the side only, without upward extension along the anterior margin of the eye.

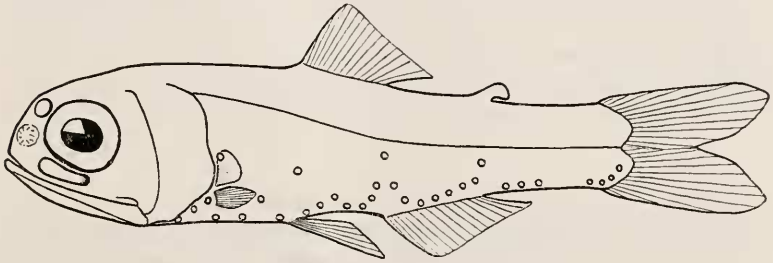

Fig. 4. *Diaphus intermedius* Borodin

Height from pectoral fin base to PLO only about two-thirds of the height from PLO to lateral line. 2 PVO in a straight oblique series with the first PO. 5 PO. Second PO entirely behind vertical form posterior PVO. Fourth PO elevated approximately to the level of the upper PVO. VLO about midway between the lateral line and the base of ventral fin. 5 VO. First to third VO in a straight, obliquely ascending series. Fourth and fifth VO lower, on a horizontal line. 3 SAO in an approximately straight or very faintly angular series, the continuation of which would fall behind the fifth VO. Lower SAO about equidistant from fifth VO and second SAO. Interspace between second and upper SAO much greater than the lower interspace in the same series. Upper SAO about 1½ to 2 diameters below lateral line. AO 7 + 3. First AO anterior elevated approximately to the level of second SAO. Second AO anterior also distinctly elevated. Third AO anterior lowest of the series, from which organ (AO_3) a straight, obliquely ascending series is formed posteriorly by the rest of the AO

anteriores. 1 POL about 2 diameters below the lateral line. AO posteriores in a horizontal series a short distance removed from the base of anal fin. A fourth AO posteriore may possibly have been lost on both sides in the type. 4 PRC equally spaced, in a gradually curving series along the lower part of the base of caudal fin, widely separated from AO posteriores, and extending with the upper PRC only about halfway up from the ventral margin of the tail towards the lateral line. Last interspace in PRC-series slightly enlarged.

A large luminous scale at PLO occupying practically the entire space between this photophore and the pectoral fin.

The following measurements were obtained from the type specimen: Total length without caudal fin 58 mm. Proportions in percent of the length without caudal fin: Length of head 33 percent. Length of maxillary 23 percent. Diameter of eye 12 percent. Greatest depth of body 27 percent. Distance from snout to ventral fins 46 percent. Distance from snout to dorsal fin 51 percent. Distance from snout to anal fin 66 percent. Depth of caudal peduncle 12 percent.

D 13½. A. 13½. Ll. 34.

The above counts and measurements have been verified by a re-examination of the specimen after the completion of the manuscript for these notes. It is probable that Borodin has included the badly damaged caudal fin in the proportions of the depth of the body and length of head to the length of body, thus obtaining his deviating values, although the expression "standard length of body" is used in his text. [1]

The species seems most closely related to *D. fulgens* Brauer [2] and *D. taaningi* Norman [3] and would fall under point "IV, A, 2" together with these two species in the key to the genus *Diaphus* previously published by the writer. [4] *D. intermedius*, however, differs from the other two forms by its number of anal photophores (AO 5 + 4–5 in *D. fulgens* and *D. taaningi*), by the low position of the praecaudal series (last PRC only a little below the lateral line in the other two species), by the elevated second AO anterior, by the position of the VLO, by various proportions and other features of less importance.

[1] Borodin: Proc. New Engl. Zoöl. Club, **11**, 1930, p. 89.
[2] See Parr: Deepsea fishes of the order Iniomi from the waters around the Bahama and Bermuda Islands. Bull. Bingham Oceanogr. Coll., **3**, Art. 3, New Haven, Conn., 1928, pp. 116–117. Only *D. fulgens* Brauer mentioned under point IV, A, Z, *D. taaningi* being a later addition.
[3] J. R. Norman: Oceanic fishes and flatfishes collected in 1925–1927. Discovery Reports, **2**, Cambridge, 1930, p. 332.
[4] See Parr: Ibid.

Diaphus rafinesquei Cocco

Diaphus theta Eigenmann and Eigenmann 1891.

In addition to the specimen of *theta* labelled "Type" in the United States National Museum (No. 41914), previously reported upon by the writer, [1] there is also a specimen (No. 27392) in the Museum of Comparative Zoölogy designated as type of this species. The Cambridge specimen is in a very poor condition, so that it is difficult to make out its characters in any great detail, but it does not appear to differ from the Washington specimen.

Diaphus garmani Gilbert

Diaphus garmani Gilbert, Bull. Mus. Comp. Zoöl., **46**, 1906, p. 258, pl. 2.
Type No. 29070 M. C. Z.

An examination of the type can only serve to confirm the excellent description and illustration already rendered in Gilbert's original account of the species and to verify the subsequent identifications by other authors.

Lampadena luminosa Garman

Myctophum luminosum Garman, Rep. Expl. Albatross 1891. XXVI. The Fishes. Mem. Mus. Comp. Zoöl., **24**, 1899, p. 263, and pl. 55, fig. 2.
Type No. 28498 M. C. Z.

Although the type is now in a relatively poor condition, the following details concerning the numbers and arrangement of the photophores can still be ascertained. PLO quite close to the lateral line, being only about one photophore-diameter removed from the latter. 2 PVO, the lower well below the pectoral fin base, well in advance of second PO and vertically below or slightly in advance of the upper PVO, which is situated in front of the lower part of the base of the pectoral fin. 5 PO, the fourth elevated approximately to the level of the lower PVO and only a short distance behind the third PO. Distance from lateral line to VLO about one-half to two-thirds of the distance from VLO to ventral fins. 5 VO in a straight and equally spaced series. 3 SAO forming a wide, concave angle. Lower SAO above and slightly behind fifth VO so that the line through these two organs runs approximately parallel with the line through second and third SAO. Second SAO somewhat higher than first SAO but only about half as far from

[1] Proc. U. S. Nat. Mus., **76**, 1929, Art. 10, p. 32 and fig. 16.

the latter organ as from the upper SAO which is situated at a distance of only about one-half of its own diameter below the lateral line well in advance of the vertical from the first AO. AO 6 + ? AO anteriores all on the same level. AO posteriores completely lost in type. 1 POL, somewhat behind the last AO anterior and about one diameter below the lateral line. There are 2 PRC'S at the lower margin of the caudal fin base and a last PRC in the lateral line well behind these. It is possible but very uncertain whether certain slight markings in this region may be taken to indicate that a third PRC may have been present well above the lower two organs of the series, so that the series as a whole would form a blunt angle.

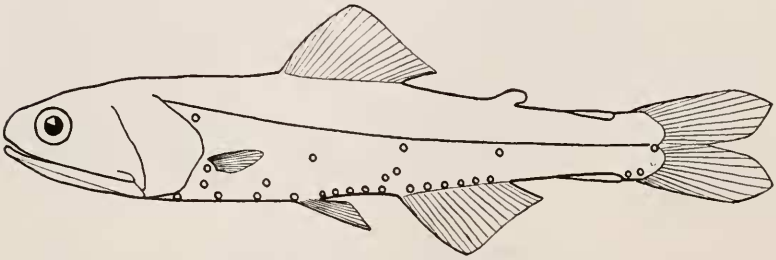

Fig. 5. *Lampadena luminosa* (Garman)

The infracaudal luminous plate occupies about 1/3–2/5 of the ventral free edge of the caudal peduncle, the supracaudal plate about 2/7–1/3 of the distance between caudal and adipose dorsal fins.

Total length without caudal fin about 100 mm. Proportions in percent of this measurement: Length of head 29. Greatest depth of body 19. Diameter of eye 5.5. Length of snout 6.5. Length of lower jaw 21. Snout to dorsal fin 40. Snout to ventrals 43. Snout to anal fin 61.

It is very unfortunate that the condition of the type still leaves in doubt the number of PRC's which would actually be present in an unmolested specimen since the claim of a specific distinction between the Pacific *L. luminosa* and an Atlantic *L. nitida* [1] has been made upon the assumption that 4 (3 + 1) PRC should be present in the form described by Garman. The basis for this assumption is found in the description of a Pacific specimen from the coast of Sumatra rendered

[1] A. V. Taaning: Synopsis of the Scopelids in the North Atlantic. Vidensk. Medd. Dansk Naturhist. Foren., **86**, 1928, p. 63. Vide: J. R. Norman: Oceanic Fishes and Flatfishes collected in 1925–1927. Discovery Reports, **2**, Cambridge, 1930, p. 336, fig. 33.

by Weber and Beaufort [1] in which three anterior lower PRC's were found in equidistant horizontal series along the lower edge of the caudal fin base. This arrangement would not entirely agree with the arrangement faintly indicated in the markings on the tail of the type of *L. luminosa*, if these markings are properly read by the present writer, but it would be futile to carry further a comparison with the hypothetical position of a possible third PRC (third of four organs) the actual existence of which remains extremely uncertain.

[1] M. Weber and L. F. deBeaufort: The fishes of the Indo-Australian Archipelago, **2**, p. 172, fig. 66, Leyden, 1913.

II. Myctophinae collected by C. O'D. Iselin in the North Atlantic in 1928

The following is an account of the Myctophinae collected by Columbus O'D. Iselin on the Schooner Atlantis in the North Atlantic during the summer of 1928, and subsequently received for identification from Dr. N. A. Borodin of the Museum of Comparative Zoölogy. [1] For the sake of completeness, the four specimens of different species from the same collections already previously identified and recorded by Dr. Borodin (loc. cit.), including the type of *Lampanyctus peculiaris*, have been reëxamined by the writer and are also dealt with in the present report so as to give a full account of the material of this particular group.

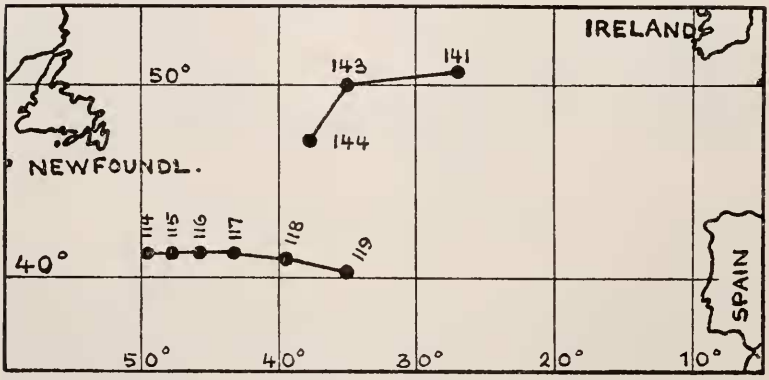

Fig. 6. ATLANTIS stations, summer 1928.

The stations from which the collections were obtained were arranged in two separate sections, each running in an East-westerly direction in mid-Atlantic about 6–10 degrees latitude apart and almost in direct succession to each other in regard to longitude, as shown in the accompanying chart. In the northern section, stations No. 141–144 run from 50° 40′ N. and 27° 16′ W. to 47° 40′ N. and 37° 20′ W.; and in the southern section, stations No. 114–119 from 40° 05′ N. and 35° 10′ W. to 41° 18′ N. and 49° 22′ W. It is of interest in connection with these differences in geographic location to make a comparison between

[1] N. A. Borodin: Atlantic Deep sea Fishes. Bull. Mus. Comp. Zoöl., **72**, 1931, No. 3, p. 55, footnotes 1 and 2.

the catches obtained in each of the two sections, which gives us the following results:

Present in both sections (7 species):

Myctophum glaciale
Lampanyctus photothorax
Lampanyctus maderensis
Lampanyctus pusillus
Lampanyctus iselini
Lampanyctus crocodilus
Diaphus dofleini

Present in the northern section only (3 species):

Diaphus metopoclampus
Diaphus rafinesquei
Diaphus gemellari

Present in the southern section only (7 species):

Myctophum laternatum
Myctophum coccoi
Myctophum benoiti
Lampanyctus warmingi
Lampanyctus alatus
Lampanyctus cuprarius
Lampanyctus resplendens

Although the material is, of course, too small to give any great weight to this comparison, it does, at least, clearly show a much richer variety of forms in the southern section than in the northern. The fact that three species of *Diaphus* were obtained in the northern section only, is undoubtedly purely accidental, as adequately proved by the other known records of these forms, but the total absence in this section of the seven species encountered only at the southern stations may have a real relationship to a greater scarcity of at least some of these forms in the more northern waters.

If we finally compare the abundance of *Myctophum glaciale* in the two sections, we discover a relationship which undoubtedly has a real bearing upon the distribution of this species. In the southern section, *M. glaciale* was encountered at only 3 out of the 6 stations at which *Myctophinae* were obtained, giving an average for these six stations of only 0.8 specimens per haul. In the northern section, *M. glaciale* was present at all three stations and was obtained in numbers from 10 to 30, with an average of 17.7 specimens per station. Between the northern and the southern section, there has thus clearly been a great decrease in the abundance of this species.

ATLANTIS COLLECTION OF 1928, BY STATIONS

Station No. 114. Lat. 41° 49′ N.; Long. 49° 22′ W., July 4, depth 800 fathoms (= 1,463 m.).

1. *Diaphus dofleini* 5 specimens

Station No. 115. Lat. 41° 29′ N.; Long. 47° 48′ W., July 5, depth 700–800 fathoms (=1,280–1,463 m.).

1. *Myctophum glaciale* 1 specimen

STATION No. 116. Lat. 41° 30′ N.; Long. 45° 57′ W., July 6, depth 700–800 fathoms (=1,280–1,463 m.).

1.	*Myctophum glaciale*	3 specimens
2.	*Lampanyctus iselini*	2 specimens
3.	*Lampanyctus alatus*	1 specimen
4.	*Lampanyctus pusillus*	3 specimens
5.	*Lampanyctus cuprarius*	2 specimens
6.	*Diaphus dofleini*	1 specimen

STATION No. 117. Lat. 41° 28′ N.; Long. 43° 29′ W., July 7, depth 700–800 fathoms (=1,280–1,463 m.).

1.	*Myctophum glaciale*	1 specimen
2.	*Myctophum laternatum*	4 specimens
3.	*Myctophum coccoi*	1 specimen
4.	*Myctophum affine*	1 specimen
5.	*Myctophum benoiti*	1 specimen
6.	*Lampanyctus photothorax*	1 specimen
7.	*Lampanyctus cuprarius*	1 specimen
8.	*Lampanyctus warmingi*	7 specimens
9.	*Lampanyctus resplendens*	1 specimen
10.	*Lampanyctus pusillus*	2 specimens
11.	*Lampanyctus crocodilus*	1 specimen
12.	*Diaphus dofleini*	2 specimens

STATION No. 118. Lat. 40° 56′ N.; Long. 39° 54′ W., July 8, depth 700–800 fathoms (=1,280–1,463 m.).

1.	*Lampanyctus pusillus*	2 specimens
2.	*Lampanyctus warmingi*	2 specimens
3.	*Lampanyctus cuprarius*	1 specimen [1]

STATION No. 119. Lat. 40° 05′ N.; Long. 35° 10′ W., July 9, depth 700–800 fathoms (=1,280–1,463 m.).

1.	*Lampanyctus photothorax*	1 specimen
2.	*Lampanyctus pusillus*	3 specimens

STATION No. 141. Lat. 50° 40′ N.; Long. 27° 16′ W., August 28, depth 800–1,000 fathoms (=1,463–1,829 m.).

1.	*Myctophum glaciale*	10 specimens
2.	*Lampanyctus iselini*	1 specimen

STATION No. 143. Lat. 50° 00′ N.; Long. 35° 20′ W., September 2, depth 500 fathoms (–914 m.).

1.	*Myctophum glaciale*	30 specimens
2.	*Lampanyctus iselini*	1 specimen
3.	*Lampanyctus photothorax*	1 specimen
4.	*Lampanyctus maderensis*	1 specimen
5.	*Lampanyctus pusillus*	2 specimens

STATION No. 144. Lat. 47° 40′ N.; Long. 37° 20′ W., September 4, depth 600 fathoms (=1,097 m.).

1.	*Myctophum glaciale*	13 specimens
2.	*Lampanyctus crocodilus* [2]	1 specimen
3.	*Lampanyctus iselini*(?)	1 specimen [3]
4.	*Diaphus rafinesquei*	1 specimen
5.	*Diaphus gemellari*	2 specimens
6.	*Diaphus metopoclampus*	1 specimen [4]

[1] *Nannobrachium nigrum* Borodin (Bull. Mus. Comp. Zoöl., **72**, No. 3, 1931, pp. 58 and 76).

[2] *Lampanyctus peculiaris* Borodin (Proc. New Engl. Zoöl. Club, **10**, 1929, p. 111; Bull. Mus. Comp. Zoöl., **72**, No. 3, 1931, pp. 58 and 77), type specimen. See p. 48.

[3] *Nannobrachium nigrum* Borodin, loc. cit. (see footnote 1).

[4] *Diaphus "metaclampus"* Borodin (Bull. Mus. Comp. Zoöl., **72**, No. 3, 1931, p. 76). *Myctophum "metaclampum"* Borodin (ibidem p. 58).

ANNOTATED SYSTEMATIC ACCOUNT

Myctophum glaciale Reinhardt

Station No. 115, 1 specimen. Station No. 116, 1 (+ 2 ?) specimens. Station No. 117, 1 specimen. Station No. 141, 10 specimens. Station No. 143, 29 (+ 1 ?) specimens. Station No. 144, 13 specimens.

The interesting difference between the northern and the southern series of stations in regard to the frequency of this species has already been pointed out in the introductory discussion of the entire collection on p. 55.

The anal organs (AO) were present in the following combinations, each side being counted and entered separately in the table.

AO		posteriores		
		6	7	8
anteriores	5		6	2
	6	20	46	1
	7	8	3	

Only 5 out of 40 specimens legible on both sides show any asymmetry in regard to the numbers of AO. In one specimen with AO 7 + 6 on both sides the two sections of this series (AO anteriores and posteriores) were practically confluent. In another specimen with AO 6 + 7 on both sides the AO posteriores were found to be confluent with the PRC. SAO_1 is generally slightly displaced ventrally from the line through the centres of VLO and SAO_2 although the three organs may in all cases be said to approach very closely to the formation of a straight series. In one specimen the 3 SAO were found to form an absolutely straight series, among themselves. In another specimen the VLO was found to be slightly but distinctly closer to the lateral line than to the ventral fins.

Myctophum laternatum atlanticum Taaning

Station No. 117, 3 specimens.

AO 6 + 3 / 7 + 3; 6 + 3 / 6 + 3; 6 + 4 (3?) / 6 + 3. Upper SAO slightly posterior to first AO.

Myctophum coccoi Cocco

Station No. 117, 1 specimen.

8 gillrakers below and 6 above in first gill arch. D. 11. A. 22. AO 6 + 13 / 6 + 12. First SAO vertically above second VO.

Myctophum affine Lütken

Station No. 117, 1 specimen.

AO 8 + 5 / 8 + 5. Length without caudal fin 15.5 mm.

Myctophum benoiti Cocco

Station No. 117, 1 specimen.

AO 6 + 6 / 6 + 6. Specimen very small.

Lampanyctus warmingi Lütken

Station No. 117, 7 specimens. Station No. 118, 2 specimens. Station No. 143, 1 specimen.

The specimens above listed are all less than 20 mm. long, exclusive of the caudal fin, and mostly not in a very good condition. It is therefore in many of them rather difficult to make out the presence of the various luminous scales so characteristic of this species. This may partly be due to molestation or bad preservation, partly to a relatively undeveloped stage of these luminous scales in such small specimens. In the better ones, however, most of the luminous scales, or traces or indications thereof, can be found by close examination. This holds in the three scales on each side of the throat and the luminous scales flanking the anus, as well as those of the anal fin and the caudal peduncle, but not of the median single series between anus and vent. These may not have developed their special character as yet or may have become lost. The anal organs were found in the following combinations:

AO		posteriores		
		5	6	7
anteriores	5			3
	6	2	15	

Only one asymmetric specimen, of the nature AO 6 + 6/5 + 7, was found.

Lampanyctus resplendens Richardson

Station No. 117, 1 specimen.

AO 7 + 5 / 7 + 5. 37 vertebrae inclusive of the ultimate caudal centrum. 39 scales in the lateral line (as counted by the scars left of the scale pockets). 3 POL in a straight series which is approximately horizontal but when more closely observed may be seen to descend

from the lateral line posteriorly at an angle of about 2°. The specimen is small (22 mm. exclusive of caudal fin) and in several respects rather poorly preserved (skin much abrased) so that it has not been deemed advisable to make it the basis for a more detailed account of the species, although such an account is very badly needed at the present time. The fact that *L. castaneus* Goode and Bean, in which 3 POL are also present, must be considered distinct from *L. resplendens* on the basis of its scale and vertebrae counts, has already previously been pointed out by the writer. [1]

Lampanyctus photothorax Parr

Station No. 117, 1 specimen. Station No. 119, 1 specimen. Station No. 143, 1 specimen.

AO 5 + 4 / 5 + 4; 4 + 5 / 4 + 5; 6 + 4 / 6 + 4. In the specimen from Station No. 119 (AO 4 + 5) a duplication of the first PO on one side is observed, two fully developed organs of quite normal size being found about one diameter apart on the same level, the anterior one in the normal position of the first PO, opposite the single organ on the other side. While the other luminous scales and glands described for this species are all to be found also in the specimens here reported upon, the luminous scale on the thorax cannot be made out on a single one of them, and the conclusion that the development, or at least the presence or recognizability of this organ in preservation, may, on occasion, prove a less reliable feature is also borne out by some of the samples in the much larger material in the Bingham Oceanographic Collection.

Lampanyctus cuprarius Taaning

Station No. 116, 2 specimens. Station No. 117, 1 specimen. Station No. 118, 1 specimen.[2]

The above specimens agree with the descriptions of this species rendered by Taaning [3] and by Parr [4] in regard to all proportions and to the arrangement of the luminous organs, but show somewhat higher fin counts than the previously recorded averages for this form, namely: D. 17. A. 19, in 3 specimens; D. 17. A. 20 in one.

[1] Copeia (Journ. Amer. Assoc. Ichthyol. Herpetol.) 1930, p. 89.
[2] *Nannobrachium nigrum* Borodin (nec Gunther): Bull. Mus. Comp. Zoöl., **72**,, 1931, No. 3, pp. 57 and 76 (partim.).
[3] Taaning: Synopsis of the Scopelids in the North Atlantic. Vidensk. Medd. Dansk Naturhist. Foren., **86**, p. 68, Copenhagen, 1928.
[4] Parr: Bull. Bingham Oceanogr. Coll., **3**. Art. 3, p. 106, fig. 18, New Haven, Conn., 1928.

Lampanyctus pusillus Johnson

Station No. 116, 3 specimens. Station No. 117, 2 specimens. Station No. 118, 2 specimens. Station No. 119, 3 specimens. Station No. 143, 2 specimens.

AO 3 + 6 in 1 count (assymmetric with AO 4 + 6); AO 4 + 6 in 17 counts; AO 5 + 5 in 6 counts.

Although the species is present in both sections, it is evident from the above list of the samples that it was more abundant at the southern series of stations (Nos. 116–119).

Lampanyctus alatus Goode and Bean [1]

Station No. 116, 1 specimen.

Lampanyctus iselini spec. nov.

Type No. 33223 M.C.Z. Atlantis 1928, Station No. 116. Lat. 41° 30′N.; Long. 45° 57′ W.; July 6. Depth 700–800 fathoms (=1,280–1,463 m.).

In addition to the type the collection also contains another specimen (cotype) from station No. 116; one specimen from Station No. 141; one (?) from Station No. 143; and one (?) [2] from Station No. 144.

2 photophores on each cheek. One in, or a little in advance of the middle of the cheek, and another, slightly smaller, immediately in advance of the preopercular free edge. The two organs are situated approximately in a straight line from the centre of the eye parallel with the maxillary. The anterior photophore on the cheek is well preserved in all specimens. The posterior organ is apparently easily subject to loss by abrasion and is found in its normal position only on one side each in the type and cotype, being entirely lost from the other side in both specimens. In the largest specimen (from Station No. 141) the posterior organ on the cheek is only to be found on one side in a tassel of frayed skin barely attached near the corner of the mouth, so that the normal position of the photophore in question cannot be determined in this case.

PLO very high, its distance from the lateral line only about one-third of its distance from pectoral fin. 2 PVO, the upper at the upper part of the pectoral fin base, the lower immediately below the level of the lowest pectoral rays, and slightly behind the upper PVO, in or slightly in advance of the line between upper PVO and second VO.

[1] See Parr: Proc. U. S. Nat. Mus., **76**, Art. 10, p. 25, fig. 12, Washington, 1929.
[2] *Nannobrachium nigrum* Borodin (nec Günther): Bull. Mus. Comp. Zoöl., **72**, No. 3, 1931, pp. 58 and 76 (partim.).

In the type the series formed by the two PVO and PO_2 is practically straight, in the other specimens the deviation from a straight line is somewhat more conspicuous. 5 PO. Fourth PO elevated to, or slightly above the level of the upper PVO. VLO somewhat closer to the lateral line than to the ventral fin, its distance from the former about two-thirds of its distance from the latter. 4 VO, in an equidistant series on the same level. 3 SAO, bluntly angulate. First SAO above interspace between second and third VO on the same level as the second SAO which is closer to the upper than to the first SAO, and closer to the fourth VO than to the upper SAO. Fourth VO, second and third SAO

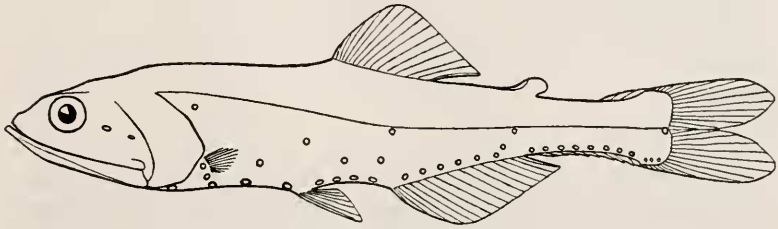

Fig. 7. *Lampanyctus iselini* spec. nov.

forming a very nearly straight oblique series, with the fourth VO only slightly advanced from the line through the centres of the other two organs. Upper SAO at the lateral line in advance of the vertical from the first AO. AO 6 + 8 — 9 (9 AO posteriores on one side in the cotype, but no variations in the other specimens). AO anteriores in a gently convex series with the second and third organs highest. 2 POL in an oblique line forming a nearly or entirely straight series with the last AO anterior. Lower POL closer to AO than to upper POL, which is at the lateral line. AO posteriores entirely behind the base of anal fin, more or less confluent, with the PRC, which can nevertheless be easily distinguished by their smaller size and closer arrangement (see figure).[1] 4 PRC, 3 small organs in a close-set, gently curved series at the lower margin of the caudal fin base; and an upper, larger organ in the end of the lateral line, far above and slightly behind the penultimate PRC.

About 9 infracaudal luminous scales occupy the entire ventral edge of the caudal peduncle between the bases of anal and caudal fin. 3

[1] PRC's partly lost on both sides in the type. Their arrangement described from cotype and other specimens.

supracaudal luminous scales occupy about one-third of the distance between caudal fin and adipose dorsal. A luminous scale covers the anterior edge of the adipose dorsal fin.

Table of Measurements

Total length without caudal fin in mm.		28[1]	44
Length of head	In per cent of length without caudal fin	29	30
Diameter of eye	"	6	5.5
Length of snout	"	5.5	6
Length of maxillary	"	23	22
Depth of body	"	20	17
Depth of caudal peduncle	"	9	9
Snout to D	"	49	49
Snout to V	"	43	43
Snout to A	"	56	58

Snout pointed, eyes moderate, about equal to snout. Jaws long. Preopercular margin strongly oblique. Body slender and compressed.

Pectorals very small, not reaching to the bases of the ventrals. Their rays feeble. Ventrals short, inserted well in advance of dorsal fin, barely reaching to the anus but not to the origin of anal fin. Dorsal origin near the middle of the body. Anal origin under the posterior rays of dorsal fin (overlap somewhat less than suggested in the figure). Adipose dorsal immediately behind termination of anal fin.

D. 13 (Type)–14. A. 17–18 (Type). V. 8. P. 12–13. There are 37 scale-pocket scars, corresponding to the number of myotomes between the shoulder and the base of caudal fin, 38 if the last scar left by a scale which must have extended beyond the caudal fin base is included.

It is clear from a few preserved scalepocekts on the cotype and on the larger specimen from Station No. 141 that the mediolateral (or lateral-line) scales of the caudal peduncle must have been enlarged to cover about two-thirds or more of the height of the peduncle.

L. iselini is easily distinguished from the only other species of *Lampanyctus*, *L. taaningi* Parr [2], which is normally known to possess two photophores on each cheek, and two only, by the fact that the pectorals of *L. taaningi* are very long and well developed, whereas those of *L. iselini* are of the reduced or rudimentary *Nannobrachium-*

[1] Type specimen.
[2] Proc. U. S. Nat. Mus., **76**, Art. 10, p. 27. Washington, 1929.

type. *L. isclini* also differs by the presence of the luminous scale in adipose fin, by the low position of the third PRC, and by other additional features.

Keeping in mind the apparently quite great chance of loss of the posterior photophore on the cheeks in particular, *L. isclini* has also been compared with the species described as having only one photophore on each cheek and has been found to differ from each of these various species separately in the following ways: from *L. punctatissimus* Gilbert (AO 6[1] + 6; VLO, SAO_3, POL_2 and PRC_4 equally elevated, near the lateral line) by the lower position of VLO and by the number of AO; from *L. jordani* Gilbert by not having the second and third AO anteriores separately elevated above the rest of the series, by the lower position of VLO and the higher position of the cheek organ; from *L. stilbius* Gilbert (Eye less than 3 in head, AO 6 + 4) by the much smaller eyes and different number of AO; from *L. pusillus* Johnson by the higher position of VLO, the different number of AO, the reduction of the pectorals, and the presence of luminous scale in adipose fin; from *L. ritteri* Gilbert by the higher position of VLO and the entirely different position of the main organ on the cheek and by the presence of a luminous scale in adipose dorsal; from *L. regalis* Gilbert (5 VO) by the position of the main organ on the cheek, by having only 4 VO and by the presence of a luminous scale in the adipose dorsal fin; from *L. alatus* Goode and Bean by the reduction of pectoral fins, the number of AO, the positions of VLO and of ultimate PRC (in relation to PRC_3); from *L. intricarius* Taaning by the reduction of pectoral fins and the number of AO.

On the basis of these comparisons, the new species is herewith introduced, although confirmation of its characters from better preserved specimens still seems desirable.

Some doubts about their actual identity still attach to two of the specimens tentatively listed above as *L. isclini*, particularly to the specimen from Station No. 144. This specimen is the largest of the lot (47 ml. exclusive of caudal fin) but is unfortunately in a rather poor condition, and it is impossible to discover any trace of a posterior photophore on the cheeks. The PRC and the ultimate AO posteriores are also lost, but it seems probable that there may have been 7 + 9 AO in the undamaged specimen. All the AO anteriores are, on the other hand, well preserved on both sides. The specimen differs from the

[1] Gilbert (Mem. Carnegie Mus., **6**, No. 2, p. 103. Pittsburg, 1913), in giving the numbers of antero-anals, counts only one POL, designating the lower POL in the usage of Brauer *et al*, as an elevated AO anterior.

other species previously described in having only one organ on each cheek in exactly the same position as one of the pair in *L. iselini* and has therefore been tentatively identified with the latter.

Lampanyctus crocodilus Risso

Lampanyctus peculiaris Borodin, Proc. New Engl. Zoöl. Club, **10,** 1929, p. 111; Bull. Mus. Comp. Zoöl., **72,** No. 3, 1931, pp. 58 and 77.

Station No. 117, 1 specimen. Station No. 144, 1 specimen (type of *L. peculiaris* Borodin).[1]

AO 6 + 8 symmetrically in both specimens.

Diaphus metopoclampus Cocco

Diaphus "metaclampus" (*sic.*), Borodin, Bull. Mus. Comp. Zoöl., **72,** No. 3, 1931, p. 76.

"Myctophum metaclampum" (*sic.*), Borodin, loc. cit., p. 58.

Station No. 144, 1 specimen.

AO 6 + 6 on both sides. Last AO anterior slightly elevated. Length without caudal fin 58 mm. Although well recognizable, the characteristic shape of the antorbital organs is less sharply defined in this specimen than in the other samples of the species previously seen by the writer. So far as the marginal projection of the upper antorbital is concerned, this is evidently largely due to damage. But in the rather gradual, instead of very abrupt, posterior expansion of the lower antorbital, we apparently see a natural feature of the specimen at hand. The 4 PRC are arranged in a straight, very oblique series (about 45°) extending upwards to a short distance below the lateral line, with the ultimate interspace increased to equal the entire distance from the first to the third PRC. Second interspace (PRC) also somewhat greater than the first.

Diaphus gemellari Cocco

Station No. 144, 2 specimens.

These two specimens together with the material of *D. dofleini* recorded below do not entirely remove the author's doubts as to whether the two species are actually distinct from each other or merely represent groups of individual variants, although it must be admitted that they are rather easily differentiated in this small collection. The two specimens listed above (67 and 37 mm. lengths exclusive of caudal fin) show approximately the same arrangement as that shown in Bull.

[1] See p. 48.

Bingham Oceanogr. Coll., Vol. III, Art. 3, fig. 22, No. 5, with OA_4, OA_5 and POL forming only a very slight angle and with first AO posterior elevated. They also show a slightly but distinctly increased interspace between PRC_3 and PRC_4 although it does not nearly reach the width of the same interspace in *D. doflcini*. AO 5 + 5 (?) on both sides in both specimens.

Diaphus dofleini Zugmayer

Station No. 114, 5 specimens. Station No. 116, 1 specimen. Station No. 117, 2 specimens. Station No. 144, 4 specimens.

As here identified *D. doflcini* is characterized by the greatly increased interspace between PRC_3 and PRC_4 and by the fact that the last AO anterior is in or below the line between penultimate AO anterior and POL, while in *D. gemellari* the ultimate AO anterior is always situated more or less above this line. Individual variations, however, seem to bridge the gap between the two forms or groups of specimens thus defined and it does not seem quite certain as yet whether they actually represent distinct species (see under *D. gemellari*, above). AO 5 + 5 in 18 counts; AO 5 + 6 in 3 counts.

Diaphus rafinesquei Cocco

Station No. 144, 1 specimen.

AO 6 + 4 on both sides. A typical representative of *D. rafinesquei, sensu stricto*, also in regard to the characters by which Taaning has attempted to differentiate this form as a separate species from *D. holti* Taaning.